In this regard, the above amendment presents a new set of claims free from the objections set forth in Official Action paragraph 2.

More specifically, the tests recited in new claim 17 are described in the present specification on page 16 (FT-IR measuring method), page 11 (Woolmark Test Method 31) and page 12 (JIS L-1076.6.1A).

Further, a copy of the Woolmark Test Method 31 method is enclosed.

The Official Action questions the use of JIS L-1015, which appears in claim 20, in reply, this test is described on page 6, line 25 and page 11, line 16 et seq. of the present specification and a copy of this test in Japanese with an English translation of the pertinent portions is enclosed.

Claim 1 to 8 and 15 have been rejected under 35 U.S.C. 102(b) as anticipated by or in the alternative, under 35 U.S.C. 103(a) as obvious over Hojo et al. (US 5,824,113).

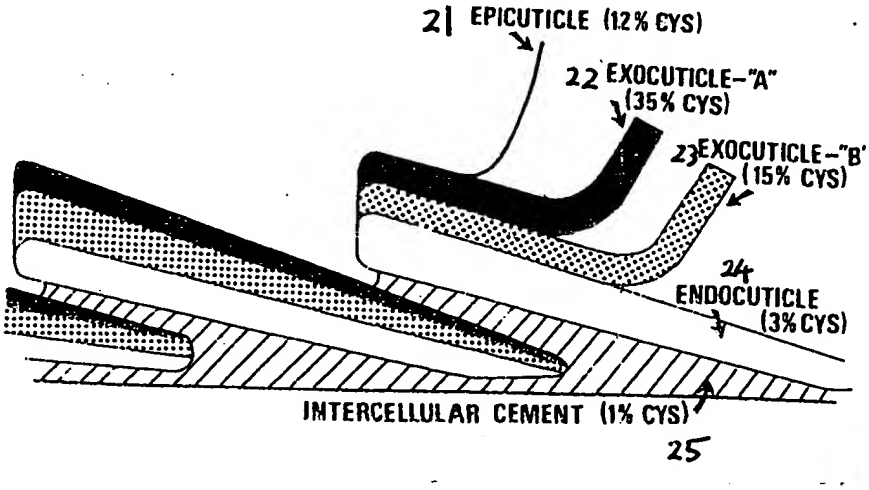
This rejection is respectfully traversed.

A brief discussion of the present invention will be of assistance in appreciating applicants' reasons for traversal in rejection.

The present invention provides animal fibers simultaneously having excellent shrink proofing properties and pilling resistance in addition to water repellent properties. Such an animal fiber is novel and unobvious over the prior art.

The surface portion of the animal fiber has a longitudinal cross sectional structure as below:

Figure 10 – Wool fibre cuticle – schematic.



An epidermal tissue (cuticle) portion, called scales, consists of an epicuticle layer (21), an exocuticle A-layer (22), an exocuticle B-layer (23) and an endocuticle layer (24) as an innermost layer. These layers are stacked in this order from outside (see page 13, lines 11 to 25 of the present specification).

With respect to Hojo et al., this reference removes the scales from the surface of animal fibers and can not retain the water repellant properties that the animal fiber originally possessed. As Hojo discloses, "it is possible to remove only the keratin parts" (see ABSTRACT of Hojo), "c) keratin layers removing step ...the keratin layers may be removed from the underkeratin layers and non-keratin protein layers may be exposed (column 3, lines 20 to 27), "The method of modifying keratin fiber represented by wool according to the present invention enables peeling off the keratin parts which form scales without damaging the non-keratin protein of the wool" (column 5, lines 59 to 62), "the water-repellant keratin parts fell off from the fiber" (in column 6, lines 31 to 32), "Complete removal of the keratin in cuticles was ascertained by microscopic observation of " (column 8, lines 41 to 42).

In Hojo et al., the scales of the surface portion of the animal fibers are removed, the surface of the fabric becomes hydrophillic (column 6, lines 54 to 55 and column 7, lines 30 to 31 of Hojo et al.). Accordingly, the animal fiber modified according to the Hojo et al. can not have properties of water-repellency that the animal fiber originally possessed in contrast to the animal fibers presently claimed.

For the foregoing reasons, it is apparent that the rejections on Hojo et al. are untenable and should be withdrawn.

Claims 9-14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hojo et al. as applied to claims 1-8 and 15 above, and further in view of Thorsen (US 4,189,303).

This rejection is also respectfully traversed.

Hojo et al. is discussed above.

With respect to Thorsen, it discloses a method for treating proteinaceous animal fiber with aqueous solution of ozone.

The rejection indicates that Thorsen illustrates proteinaceous fibers contacted with a steam-ozone mixture on page 6, lines 5 to 6 of the Official Action.

However, as Example 1 discloses, "An aqueous solution of ozone containing 10.0 mg/l of ozone was passed into the funnel in the back flow direction at a rate of 31.1 l/min and a temperature of 27°C", the aqueous solution of ozone was used to oxidize animal fiber, being same in use of aqueous solution of ozone in Examples 2 and 3. Thorsen also disclosed in the SUMMARY OF THE INVENTION that "Of course, the '906 process and the present process also differ in that a stream of steam and an ozone-air (or oxygen) stream are simultaneously impinged upon the fabric in the former method whereas in the latter method the fabric is contacted with an aqueous ozone solution" in column 3, lines 11 to 17.

Therefore, Thorsen's invention is that animal fibers are oxidized in an aqueous solution of ozone.

In Thorsen, fabrics of proteinaceous fibers are contacted with an aqueous solution of ozone at a temperature of about 0-50°C in a concentration of ozone in water of 1-20 mg/l (column 3, lines 21 to 28). Such an oxidation can partly oxidize cystine bonding -S-S- in proteinaceous fibers.

In addition, Thorsen does not disclose anywhere that the oxidized cystine bonding -S-S- is cleaved to form a specified amount of $-SO_3H$ and/or $-S-SO_3Na$ measured by FT-IR.

Thorsen does not disclose or suggest that such an animal fiber as in the present invention can simultaneously demonstrate excellent shrink proofing properties and pilling resistance in addition to water repellent properties.

Particularly, as shown with respect to Example 1 and Comparative Example 2 in Table 1, page 46 in the present specification, a mere oxidation by ozone can not achieve the shrink proofing properties of the present invention, even if the proteinaceous fibers are subjected to reduction reaction.

In other words, the excellent shrink proofing properties can not be achieved only by oxidation in such an aqueous solution of ozone as in Thorsen, even if followed by reduction reaction to cleave the oxidized S-S bonding.

Please refer to the felt shrinkage test carried out in the present invention.

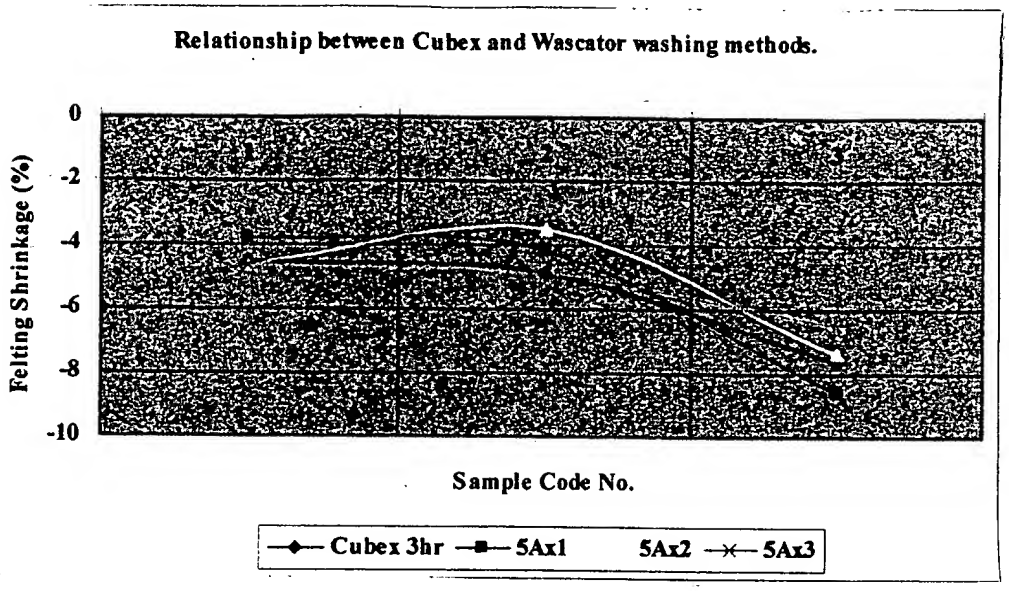
It is described in the present specification with respect to the shrinkage test that ① "area shrinkage rate of not more than 8% in a three-hours aqueous washing when measured as a felting shrinkage rate in conformity with Woolmark Test Method 31" (page 6, lines 14 to 18, in the specification), ② "the felting shrinkage rate is measured in conformity with WM TM31 method (Woolmark Test Method 31), and a fabric knitted into a cover-factor C.F. 0.41 with one thread taken from 14 gages being used as a sample. Here, "conformity to "WM TM31 method" refers to the fact that the measurements were carried out in accordance with the testing procedure of WM TM31 method based upon the ISO 6330 method, while the test washing machine was changed to a Cubex shrinkage testing machine." (page 11, lines 7 to 15).

Attached is the manual for the "WM TM31 method". The main modifications of the WM TM 31 test in the present evaluation are in the washing machine, washing times and washing cycles.

In the present invention, a Cubex shrinkage testing machine was used instead of Wascator (in WM TM31), washing time is 3 successive times instead of 12 minutes, and the washing cycle is one.

The modified WM TM31 test in the present evaluation is rather more severe as compared to standard WM TM31 test, as shown below.

By using the Cubex (40x40x40 cm^3) International Shrinkage apparatus (specified by IWS TM 185/186 on or about1981) containing 15L-aqueous washing liquor, the washing time was selected as successive 3 hours at 40°C from applicants' preliminary test results using the knitted fabric shrink-resisted by the present ozone-treatment, which is indicated in the below Figure. That is, the felting potential by the 15L-Cubex ("Cubex 3hr" line in the figure) is roughly same or rather more severe as compared to ISO 6330 5A x 1 cycle ("5Ax1" line in the figure), ISO 6330 5A x 2 cycle ("5Ax2" line in the figure), or ISO 6330 5A x 3 cycle ("5Ax3" line in the figure) of TM31 using a Wascator shrinkage apparatus.



Note: "5A" in the figure means "ISO 6330 5A".

The minus (-) in the figure shows a contraction percentage of the washed knitted fabrics.

The sample code No.1, 2, and 3 in the above figure indicates various samples of the knitted fabric composed of the different twist number of 2/48Nm worsted yarn, but the cover factor of the knitted fabrics was 0.41 respectively, i.e., yarn twist of No. 1 was Z480 x S270, No. 2 Z480 x S280 and No. 3 Z480 x S260. (The higher the S value is, the more tightly the fabrics are twisted).

On the other hand, Thorsen carried out shrinkage test in accordance with AATCC Method 124-1973 (column 4, line 50).

This AATCC Method 124-1973 is not practical to evaluate shrinkage properties i.e., from the viewpoint of practical use.

For the foregoing reasons, it is apparent that the rejections on prior art are untenable and should be withdrawn.

With regard to the rejection on double patenting over claims 7 to 14 of co-pending application Serial Number 09/721,772, this rejection is inapplicable in view of the above amendment.

No further issues remaining, allowance of this application is respectfully requested.

If the Examiner has any comments or proposals for expediting prosecution, please contact the undersigned at the telephone number below.

Respectfully submitted,

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